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HIKITA, Naoko
Department of Health Sciences, Graduate School of Medical Sciences, Kyushu University

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Review Article

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Naoko Hikita

Department of Health Sciences, Graduate School of Medical Sciences, Kyushu University

Introduction

Tobacco smoking is a global public health problem, which has several health risks such as stroke, coronary artery disease, myocardial infarction, lung cancer, chronic obstructive pulmonary disease, erectile dysfunction, and perceived addictiveness[1]. Eight million people die from tobacco smoking each year, including one million deaths from secondhand smoke (SHS) exposure. In addition, more than 80% of the 1.3 billion smokers worldwide live in low- and middle-income countries, increasing the disease burden and tobacco-related mortality in these regions.

Mongolia has a high number of smokers and has reduced SHS exposure by banning smoking in public places. However, in Mongolia, smokers prefer to smoke indoors, especially in winter, when temperatures reach −20℃, increasing the risk of SHS exposure in non-smokers. Further, SHS exposure during pregnancy has several harmful effects on mothers and fetuses. This review discusses SHS exposure among pregnant women in Mongolia and preventive interventions.

1. Definition of SHS

SHS includes sidestream smoke (released from the burning end of cigarettes) and mainstream smoke (exhaled by smokers)[2,3]. More than 4,000 chemicals have been identified in tobacco smoke. The U.S. Surgeon General concluded that "*There is no risk-free level of exposure to secondhand smoke. Breathing even a little secondhand smoke can be harmful to your health.*"[4]

SHS can cause coronary heart disease, lung cancer, and stroke in adults, and sudden infant death syndrome, ear infections, respiratory symptoms, and acute lower respiratory infections in infants and children[5-7]. SHS exposure during pregnancy harms both the mother and the fetus ; it causes a decrease in infant birth weight[8-10], and increases the risk of congenital fetal malformations[9,11], stillbirth[11], preterm birth[12,13], small for gestational age[10,14], and pre-eclampsia[15]. SHS exposure during pregnancy increases the risk of low birth weight (< 2500 g) by 22%, reduces mean birth weight by 33 g or more[8], and increases the risk of stillbirth by 23% and congenital malformation by 13%[11]. A meta-analysis reported that SHS exposure reduces infant weight by 60 g. SHS-exposed infants also had a height that was longer by 1.75 cm, and an increased risk of congenital anomalies by 17%[9].

Several methods have been used to assess SHS exposure, including self-administered questionnaires, measurement of indoor concentrations of SHS constituents (nicotine, carbon monoxide, and nitrogen oxide), and measurement of biomarkers such as cotinine, a nicotine metabolite, in blood, saliva, urine, and

Corresponding author : Naoko Hikita
Department of Health Sciences, Graduate School of Medical Sciences, Kyushu University, 3-1-1 Maidashi, Higashi-ku, Fukuoka 812-8582, Japan
Tel : + 81-92-642-6741
E-mail : hikita.naoko.419@m.kyushu-u.ac.jp

hair[16)~18)]. The half-life of cotinine is 17 h longer than that of nicotine (2-3 h)[19)]. Because of its relative stability, cotinine has been used to estimate tobacco smoke exposure. However, using biomarkers to measure SHS exposure is impractical in low- and middle-income countries because of the high cost of reagents for sample analysis, transportation and storage, and measurement limitations. Thus, self-administered questionnaires, which are widely used to assess exposure to SHS are commonly used in these countries.

2. Prevalence and risk factors of SHS exposure

The worldwide prevalence of SHS exposure among women was 35% in 2010[2)]. The prevalence of SHS exposure among pregnant women in China was 75.1% in 2008[20)] and 21.3% in 2019[21)]. The same prevalence was 60.4% in Korea from 2005 to 2006[22)], and 36.9% in Japan from 2011 to 2014[23)]. The prevalence of SHS exposure was 45.8% and 35.7% among women in Mongolia in 2013[24)] and 2019[25)], respectively. This prevalence was 44.8% among non-smoking pregnant women in Mongolia from November 2015 to January 2016[26)]. In that study[26)], SHS exposure was assessed using urinary cotinine (UC) levels. UC levels were classified into three categories : not exposed to SHS (UC levels of < 5 ng/ml), exposed to SHS (UC levels of 5-100 ng/ml), and biochemically determined smokers (UC levels of > 100 ng/ml). As a result, 48.7% of the study population were classified as not exposed to SHS, 39.5% were classified as exposed to SHS, and 11.8% were biochemically determined smokers.

According to the WHO STEPwise approach to noncommunicable disease risk factor surveillance, the self-reported prevalence of active smoking among men in Mongolia was 49.1% in 2013[24)] and 43.7% in 2019[25)]. Furthermore, the prevalence of active smoking (as determined by urinary cotinine levels) among pregnant women's partners in Mongolia was 64.2%[27)].

Despite the difficulty of assessing SHS exposure using biological markers in low- and middle-income countries, a previous study used biomarkers and urinary cotinine levels to measure this parameter in Mongolia[26)].

There are several risk factors for SHS exposure among pregnant women. A study in New York City reported that the risk of SHS exposure during pregnancy was high among U.S.-born African Americans and people with lower educational achievement (less than 12 years)[28)]. The number of smokers in the household was positively correlated with serum cotinine levels in California, United States[29)]. Being younger, underweight (BMI < 18.5 kg/m^2), and primiparous, as well as having previous smoking history and lower educational achievement were positively correlated with SHS exposure in Spain[30)]. Furthermore, living in rural areas, living with a heavy smoker, not having smoke-free home rules, and lower scores of SHS knowledge increased the risk of SHS exposure among pregnant women in China[31)].

Older age (OR : 0.95 ; 95% CI : 0.91-0.98) and higher educational achievement (OR : 0.24 ; 95% CI : 0.09-0.60) were associated with a lower risk of SHS exposure among pregnant women in Mongolia. Moreover, female non-smokers from homes where smoking was permitted in areas, such as balconies and bathrooms, had a higher risk of SHS exposure than female non-smokers from homes where smoking was not permitted (OR : 2.25 ; 95% CI : 1.31-3.88)[26)].

A study found that pregnant women's and their partners' urinary cotinine levels were significantly correlated ($p < 0.001$), although the correlation coefficient was small (Spearman's $r = 0.250$)[27)], suggesting that pregnant women might be exposed to SHS from their partners or family members. In Mongolia, smoking is prohibited in public areas such as restaurants, bars, hotels, schools, and workplaces. As a result, smokers may smoke at home or outside the home in areas, such as the balcony, landing of the stairs, or hallway of the apartment, increasing SHS exposure among pregnant women. Thus, healthcare providers

need to acknowledge the risk factors for SHS exposure and the harmful effects of SHS on pregnant women and provide health education for these women, their partners, and household members.

3. Prevention of SHS exposure among pregnant women

Many countries have enforced restrictions on tobacco products, such as establishing smoke-free laws, using graphic health warning packages or labels to provide accurate information about the risks of tobacco, using anti-tobacco mass media campaigns, enforcing bans on tobacco advertisements, promotions, and sponsorships, and increasing taxes on tobacco[32]. Several studies have assessed the effectiveness of interventions that reduce SHS exposure. For instance, health education, including physician advice[33], educational materials such as videos and booklets[34], role plays and skills practice to improve the ability to negotiate with smoking partners[34)35)], and telephone hotlines[34] have been used to increase knowledge on the detrimental effects of SHS.

A study in Mongolia has found that portable high-efficiency particulate air filters decrease blood cadmium concentrations among pregnant women by 14%. However, the effect of this intervention was not compared between the intervention group and control group[36].

These data underscore the need to increase public awareness of the harmful effects of SHS exposure and the reduction of this type of exposure during pregnancy.

4. Conclusions

The prevalence of secondhand smoke exposure during pregnancy in Mongolia is high, and pregnant women's and their partners' urinary cotinine levels are positively correlated. Therefore, future research should assess the effects of SHS exposure and focus on preventive measures for pregnant women in Mongolia.

Reference

1) Münzel T, Hahad O, Kuntic M, Keaney JF, Deanfield JE and Daiber A : Effects of tobacco cigarettes, e-cigarettes, and waterpipe smoking on endothelial function and clinical outcomes. Eur Heart J. 41 : 4057-4070, 2020.
2) Öberg M, Woodward A, Jaakkola MS, Perugad A and Prüss-Ustüne A : Global estimate of the burden of disease from second-hand smoke. World Health Organization, 2010.
3) Centers for Disease Control and Prevention 2006. What Is Secondhand Smoke? Surgeon General's Report. Retrieved from : https://www.cdc.gov/tobacco/sgr/2006/pdfs/what-is-shs.pdf
4) US Surgeon General. The Surgeon General's report on the health consequences of involuntary exposure to tobacco smoke. (Centers for Disease Control and Prevention, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2006) Retrieved from https://www.cdc.gov/tobacco/sgr/2006/pdfs/no-risk-free.pdf
5) U.S. Department of Health and Human Services. The Health Consequences of Smoking : A Report of the Surgeon General. Atlanta (GA) : U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2004.
6) U.S. Department of Health and Human Services. The Health Consequences of Involuntary Exposure to Tobacco Smoke : A Report of the Surgeon General. Atlanta (GA) : U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, Coordinating Center for Health Promotion, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2006.
7) U.S. Department of Health and Human Services. The Health Consequences of Smoking—50 Years of Progress : A report of the Surgeon General 2014.
8) Leonardi-Bee J, Smyth A, Britton J and Coleman T : Environmental tobacco smoke and fetal health : systematic review and meta-analysis. Arch Dis Child Fetal Neonatal Ed. 93 : F351-361, 2008.

9) Salmasi G, Grady R, Jones J, McDonald SD ; Knowledge Synthesis Group. Environmental tobacco smoke exposure and perinatal outcomes : a systematic review and meta-analyses. Acta Obstet Gynecol Scand. 89 : 423-441, 2010.
10) Windham GC, Eaton A and Hopkins B : Evidence for an association between environmental tobacco smoke exposure and birthweight : a meta-analysis and new data. Paediatr Perinat Epidemiol. 13 : 35-57, 1999.
11) Leonardi-Bee J, Britton J and Venn A : Secondhand smoke and adverse fetal outcomes in nonsmoking pregnant women : a meta-analysis. Pediatrics. 127 : 734-741, 2011.
12) Rang NN, Hien TQ, Chanh TQ and Thuyen TK : Preterm birth and secondhand smoking during pregnancy : A case-control study from Vietnam. PLoS One. 15 : e0240289, 2020.
13) Cui H, Gong TT, Liu CX and Wu QJ : Associations between Passive Maternal Smoking during Pregnancy and Preterm Birth : Evidence from a Meta-Analysis of Observational Studies. PLoS One. 25 ; 11 : e0147848, 2016.
14) Lee J, Lee DR, Lee DH, Paek YJ and Lee WC : Infuence of maternal environmental tobacco smoke exposure assessed by hair nicotine levels on birth weight. Asian Pac J Cancer Prev. 16 : 3029-3034, 2015.
15) Luo ZC, Julien P, Wei SQ, Audibert F, Smith GN and Fraser WD ; MIROS study group : Plasma cotinine indicates an increased risk of preeclampsia in previous and passive smokers. Am J Obstet Gynecol. 210 : 232, 2014.
16) Jaakkola MS and Jaakkola JJ : Assessment of exposure to environmental tobacco smoke. Eur Respir J. 10 : 2384-2397, 1997.
17) Jaakkola MS and Samet JM : Occupational exposure to environmental tobacco smoke and health risk assessment. Environmental Health Perspectives. 107(Suppl 6) : 829-835, 1999.
18) WHO Regional Office for Europe, Copenhagen, Denmark, 2000. Retrieved from https://www.euro.who.int/__data/assets/pdf_file/0003/123087/AQG2ndEd_8_1ETS.PDF
19) Benowitz NL : Cotinine as a Biomarker of Environmental Tobacco Smoke Exposure. Epidemiol Rev. 18 : 188-204, 1996.
20) Yang L, Tong EK, Mao Z and Hu TW : Exposure to secondhand smoke and associated factors among non-smoking pregnant women with smoking husbands in Sichuan province, China. Acta Obstet Gynecol Scand. 89 : 549-557, 2010.
21) Yang Y, Zhang M, Bo HX, Zhang DY, Ma LK, Wang PH, Liu XH, Ge LN, Lin WX, Xu Y, Zhang YL, Li FJ, Xu XJ, Wu HH, Jackson T, Ungvari GS, Cheung T, Meng LR and Xiang YT : Secondhand smoking exposure and quality of life among pregnant and postnatal women : a network approach. BMJ Open. 12 : e060635, 2022.
22) Paek YJ, Kang JB, Myung SK, Lee DH, Seong MW, Seo HG, Cho JJ, Song HJ, Park KH, Kim CH and Ko JA : Self-reported exposure to second-hand smoke and positive urinary cotinine in pregnant nonsmokers. Yonsei Med J. 50 : 345-351 , 2009.
23) Cui M, Kimura T, Ikehara S, Dong JY, Ueda K, Kawanishi Y, Kimura T and Iso H : Japan Environment and Children's Study Group. Prenatal tobacco smoking is associated with postpartum depression in Japanese pregnant women : The Japan environment and children's study. J Affect Disord. 264 : 76-81, 2020.
24) Public Health Institute of the Ministry of Health and Sports, Mongolia. Third national STEPS Survey on the Prevalence of Noncommunicable Disease and Injury Risk Factors-2013.
25) National Center for Public Health, the Ministry of Health, Mongolia. Fourth national steps survey on the prevalence of noncommunicable disease and injury risk factors-2019. Retrieved from https://cdn.who.int/media/docs/default-source/ncds/ncd-surveillance/data-reporting/mongolia/mongolia-steps-survey---2019_brief-summary_english.pdf?sfvrsn=5ba7a1d3_1&download=true
26) Hikita N, Haruna M, Matsuzaki M, Sasagawa E, Murata M, Oidovsuren O and Yura A : Prevalence and risk factors of secondhand smoke (SHS) exposure among pregnant women in Mongolia. Sci Rep. 7 : 16426, 2017.
27) Hikita N, Haruna M, Matsuzaki M, Sasagawa E, Murata M, Yura A and Oidovsuren O : Comparison of knowledge about smoking and passive smoking and urinary cotinine levels in pregnant women and their partners in Mongolia : A cross-sectional study. Asian Pac Isl Nurs J. 4 : 47-56, 2019.
28) Hawkins SS, Dacey C, Gennaro S, Keshinover T, Gross S, Gibeau A, Lulloff A and Aldous KM. Secondhand smoke exposure among nonsmoking pregnant women in New York City. Nicotine Tob Res. 16 : 1079-1084, 2014.
29) Kaufman FL, Kharrazi M, Delorenze GN, Eskenazi B and Bernert JT : Estimation of environmental tobacco smoke exposure during pregnancy using a single question on household smokers versus serum cotinine. J Expo Sci Environ Epidemiol. 12 : 286-295, 2002.

30） Aurrekoetxea JJ, Murcia M, Rebagliato M, Fernández-Somoano A, Castilla AM, Guxens M, López MJ, Lertxundi A, Espada M, Tardón A, Ballester F and Santa-Marina L : Factors associated with second-hand smoke exposure in non-smoking pregnant women in Spain : self-reported exposure and urinary cotinine levels. Sci Total Environ. 470-471 : 1189-1196, 2014.
31） Yang L, Tong EK, Mao Z and Hu TW : Exposure to Secondhand Smoke and Associated Factors among Non-Smoking Pregnant Women with Smoking Husbands in Sichuan Province, China. Acta Obstet Gynecol Scand. 89 : 549-557, 2010.
32） World Health Organization. WHO report on the global tobacco epidemic, 2021 : addressing new and emerging products. Retrieved from : https://www.who.int/publications/i/item/9789240032095
33） Loke AY and Lam TH : A randomized controlled trial of the simple advice given by obstetricians in Guangzhou, China, to non-smoking pregnant women to help their husbands quit smoking. Patient Educ Couns. 59 : 31-37, 2005.
34） Lee AH : A Pilot Intervention for Pregnant Women in Sichuan, China on Passive Smoking. Patient Educ Couns. 71 : 396-401, 2008.
35） El-Mohandes AAK, Blake SM, Gantz MG and El-Khorazaty MN : An intervention to reduce environmental tobacco smoke exposure improves pregnancy outcomes. Pediatrics. 125 : 721-728, 2010.
36） Barn P, Gombojav E, Ochir C, Laagan B, Beejin B, Naidan G, Boldbaatar B, Galsuren J, Byambaa T, Janes C, Janssen PA, Lanphear BP, Takaro TK, Venners SA, Webster GM, Yuchi W, Palmer CD, Parsons PJ, Roh YM and Allen RW : The effect of portable HEPA filter air cleaners on indoor PM 2.5 concentrations and second hand tobacco smoke exposure among pregnant women in Ulaanbaatar, Mongolia : The UGAAR randomized controlled trial. Sci Total Environ. 615 : 1379-1389, 2018.

（References with numbers in bold are listed as particularly important ones for readers.）

著者プロフィール

疋田　直子（ひきた　なおこ）
九州大学教授（保健学部門看護学分野）
◆略歴　1977 年茨城県に生まれる．2017 年東京大学大学院医学系研究科博士課程修了．2017 年東京大学大学院医学系研究科母性看護学・助産学分野助教．2020 年獨協医科大学助産学専攻科講師．2022 年より現職．
◆研究テーマと抱負　モンゴル国における妊婦の受動喫煙
◆趣味　ベランダ菜園

（和文抄録）

モンゴル国における妊婦の受動喫煙

九州大学大学院医学研究院　保健学部門　看護学分野

疋　田　直　子

喫煙は，様々な健康被害をもたらす公衆衛生上の大きな健康問題である．毎年，世界中で 800 万人がたばこを原因とする病気で命を落としており，そのうちの 100 万人は受動喫煙が原因であると言われている．受動喫煙には，「安全な曝露レベルはない」と言われていることから，たばこの煙への少しの曝露であっても避ける必要がある．世界の喫煙者の 80％以上が低中所得国に居住しているが，モンゴル国では 43.7％の人が喫煙者で，35.7％の女性が受動喫煙をしていると報告されている．妊娠中の受動喫煙は，妊婦と胎児両方の健康に影響を及ぼし，早産や死産，先天性の異常や，胎児発育の阻害，母体の妊娠高血圧症候群のリスクを高めるなどの影響が報告されている．モンゴル国における非喫煙妊婦の受動喫煙率は 44.8％であり，年齢が若い人，学歴が低い人，家庭内全室を禁煙にしていない人が，受動喫煙のリスクが高いことが報告されている．また，妊婦とパートナー（夫）の尿中コチニンレベルが相関していることからも，妊婦はパートナーまたは同居している家族が喫煙しているたばこから受動喫煙していることが考えられる．受動喫煙予防のための対策として，法律の制定やマスメディアを使ったキャンペーン，たばこ広告の禁止，健康への害の表示，たばこ税の増税といった対策が取られている．また，医師のアドバイス，ビデオやパンフレットなどの教育媒体を用いた健康教育，喫煙するパートナーとの交渉の仕方のロールプレイ等の介入の効果が報告されている．これらの研究データは，社会全体の受動喫煙の害に対する意識を高め，妊娠中の受動喫煙の曝露を減らすことにつながると思われる．モンゴル国においても，妊婦の受動喫煙がどの程度健康に影響を及ぼしているのかを明らかにすること，また，受動喫煙を予防するための介入の効果を検証する必要がある．

キーワード：妊婦，受動喫煙，予防，モンゴル